

LESSON

11

What evidence supports evolution?

Imagine that you were a "spy" looking for clues to support evolution. Where would you look? There is evidence for evolution from the following different areas:

FOSSIL EVIDENCE Fossils are the remains, or traces, of organisms that lived long ago. The fossil record shows that organisms have changed over time. It shows that the earliest organisms were simple living things. They lived in water. Fossils show that these organisms evolved into more complex organisms over millions of years.

ANATOMY The study of the parts, or structures, of living things is called **anatomy** [uh-NAT-uh-mee]. By studying the parts of living things, we can find out how closely related they are. For example, the bones of a bat's wing and a human hand are similar. This suggests the animals are related.

Can you wiggle your ears? It's always good for a laugh, but nothing else, at least for modern humans. Ear movements are controlled by muscles. Human ear muscles are considered **vestigial** [ves-TIJ-ee-uhl] structures. Vestigial structures are "left overs." They are usually reduced in size and serve no function. Scientists think vestigial structures had a function in the ancestors of the animals that now have them. Almost all animals have vestigial structures. Humans have more than 100. The appendix is another human vestigial structure.

EMBRYOLOGY An embryo is an organism in its very early stages of development before it is born. Embryology is the study of embryos as they develop. Scientists compare the embryos of different living things to see if they are alike. Organisms with similar embryos probably evolved from a common ancestor.

BIOCHEMISTRY All living things are made up of chemicals called proteins. There are many kinds of proteins. Each has its own chemical "print" or structures. Scientists can identify the chemical make-up of proteins. They have discovered that the blood of certain animals have particular kinds of proteins. They compare the blood proteins of different animals. In this way, they can tell how closely the organisms are related.

MORE ABOUT FOSSIL EVIDENCE

- Most fossils are found in layered rocks.
- Lower layers were laid down first. They are older than the layers above them.
- Fossils found in the lower layers are older than fossils found in the upper layers.

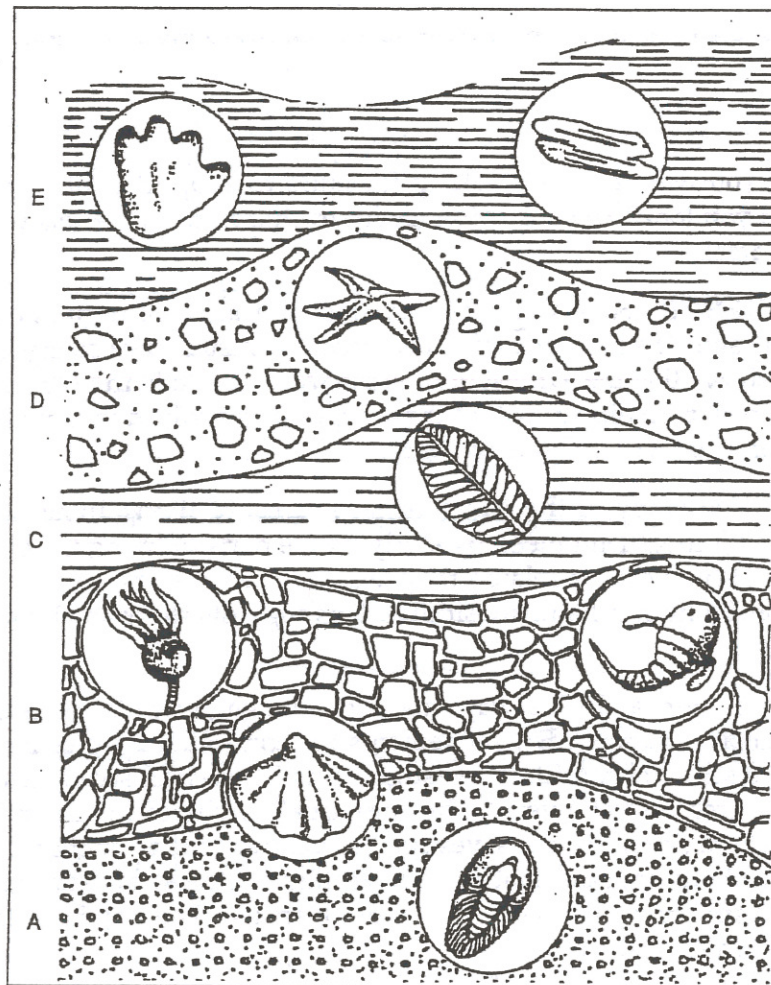


Figure A

Figure A shows five rock layers. Each contains fossils.

Study the layers and then answer the questions.

1. Which rock layer is the oldest? _____
2. Which rock layer is the youngest? _____
3. Which layer has the oldest fossils? _____
4. Which layer has the youngest fossils? _____
5. a) Fossils found in layer C are _____ than fossils found in layers D and E.
older, younger
- b) Fossils found in layer C are _____ than fossils found in A and B.
older, younger

EVOLUTION OF THE HORSE

The first horse appeared about 60 million years ago. Since that time, it has been changing. Study Figure B. What changes do you see? Fill in the correct answers.

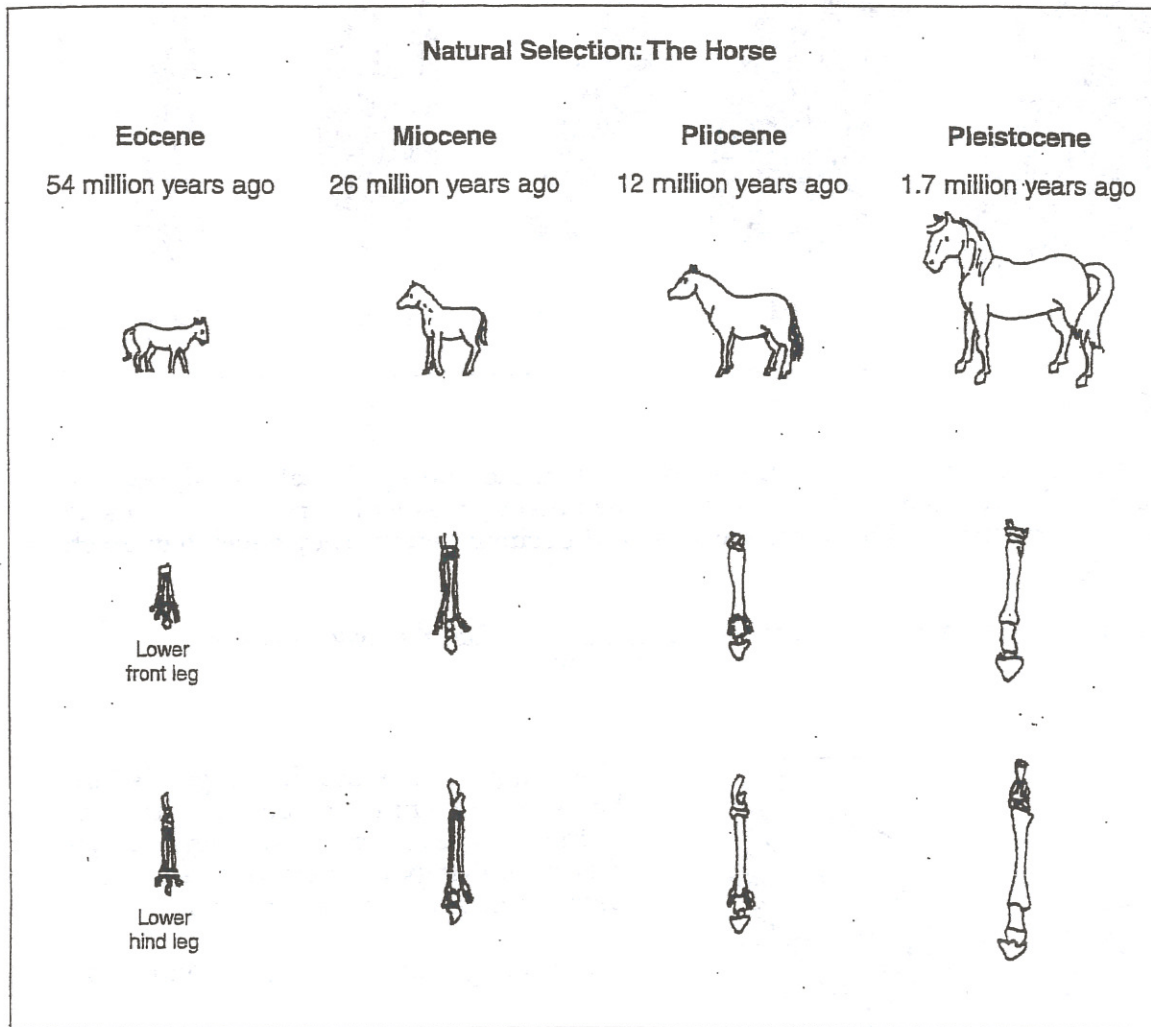


Figure B

1. What happened to the size of the horse? _____
2. The earliest horse had _____ toes.
one, many
3. How many toes does a modern horse have? _____ What is it called?
(Use your own experience.) _____

EVIDENCE FROM ANATOMY

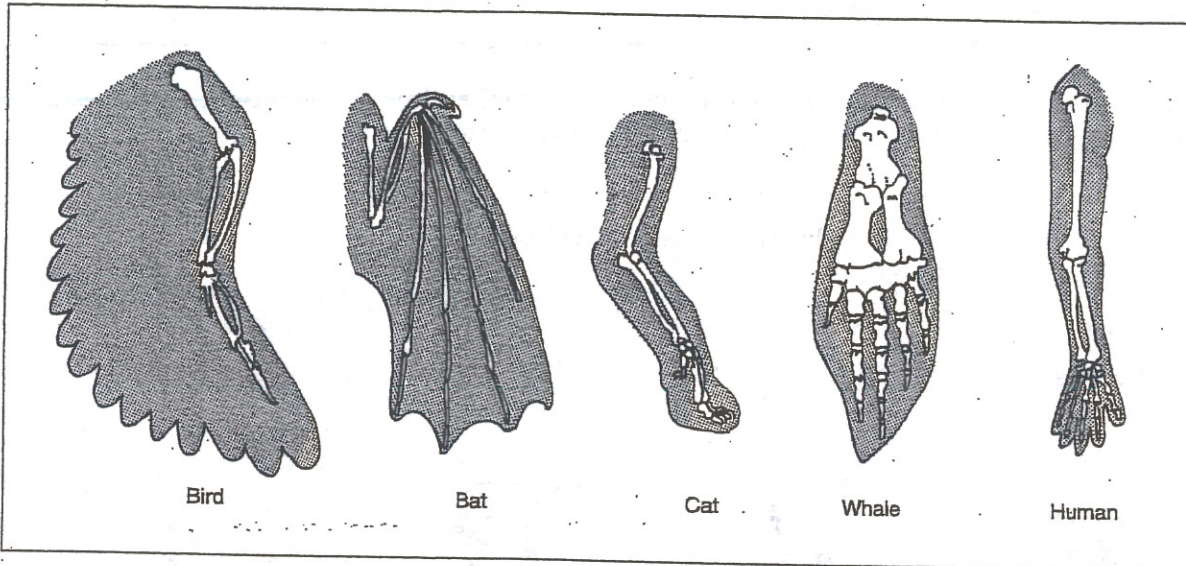


Figure C

Figure C shows the wing of a bird, the wing of a bat, the foreleg of a cat, the flipper of a whale, and the hand and arm of a human. On the outside, they look very different. Inside the bones are very similar. The bones are arranged in similar ways. They develop in much the same way.

1. Anatomy shows that these animals _____ have a close ancestor.
do, do not

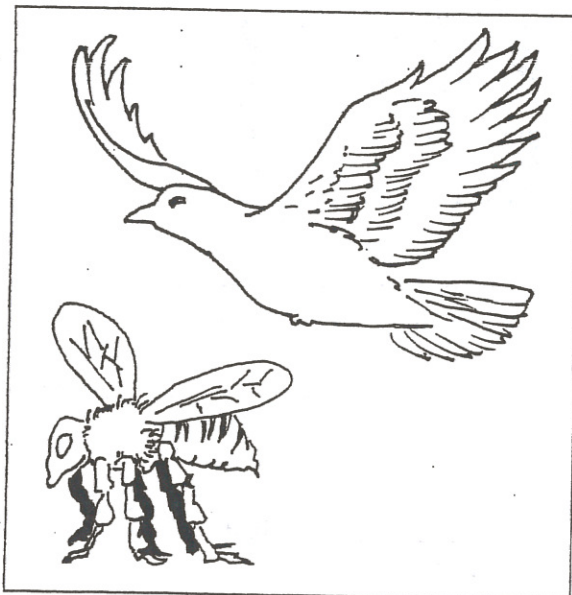


Figure D

The wings of a bee and the wings of a bird have the same function. Both are used for flying. However, their anatomy shows that their wings are very different. They develop in totally different ways.

2. Anatomy shows that birds and bees are _____ relatives.
distant, close
3. Birds and bees _____ develop along the same evolutionary "branch."
did, did not

EMBRYOLOGY

The similarity of some organisms shows that they probably evolved from a common ancestor.

Figure E shows the development of a fish, a turtle, a chicken, a pig, and a human. Study the pictures and then answer the questions.

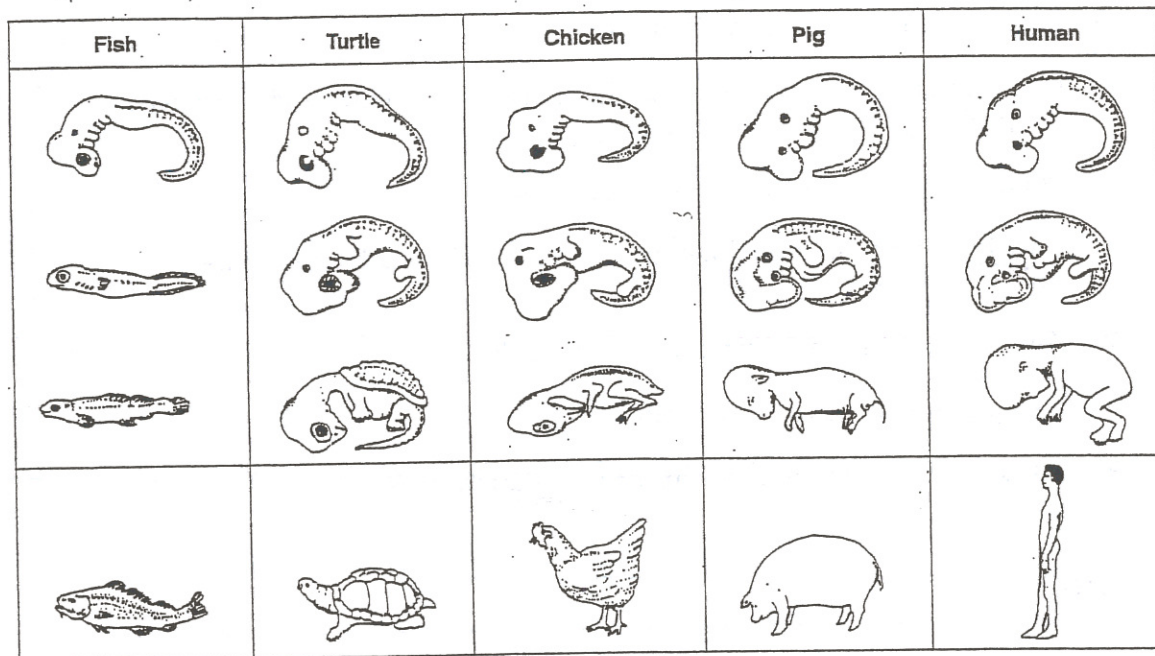


Figure E

1. The adults look very _____.
similar, different

2. The earliest embryos look very _____.
similar, different

3. Which organisms are the most closely related?

- a) chickens and humans
- b) fish and pigs
- c) pigs and humans
- d) turtles and pigs

4. Which organisms are the least closely related?

- a) fish and turtles
- b) pigs and chickens
- c) fish and humans
- d) pigs and humans

5. Embryos that are most alike are those that are the _____ closely related.
most, least

6. Embryos that are least alike are those that are the _____ closely related.
most, least

TRUE OR FALSE

In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.

- _____ 1. Fossils found in upper rock layers are older than fossils found in lower layers.
- _____ 2. Structure means how something is used.
- _____ 3. Function means how something is used.
- _____ 4. Different animals with parts that have similar structure and function are probably distant relatives.
- _____ 5. Embryology is the study of adult organisms.
- _____ 6. Closely related embryos look more alike—and for a longer time—than embryos of distant relatives.
- _____ 7. The wings of bees and birds are very similar.
- _____ 8. Vestigial organs have no functions.
- _____ 9. Blood proteins can show evolutionary relationships.

NOW TRY THIS

Read each statement. Indicate whether each statement uses anatomy (A), biochemistry (B), or embryology (E) as evidence of evolutionary relationships among organisms. Write the correct letter in the space provided.

- _____ 1. The forelimbs of a penguin and an alligator have similar bone structures.
- _____ 2. The early stages of development in a fish, a rabbit, and a gorilla look alike.
- _____ 3. In the wing of a bat and the arm of a human, you find bones called the radius, humerus, and ulna.
- _____ 4. Some blood proteins are found in almost all organisms.
- _____ 5. The finger bones in mammals have the same structure.